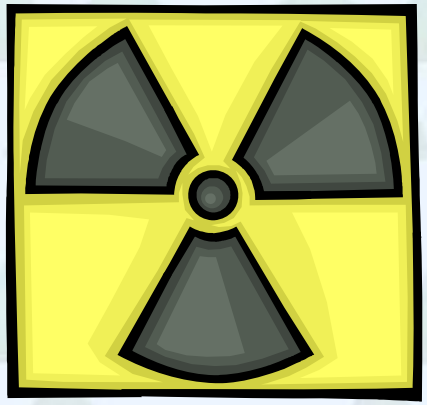
GWU Radiation Refresher Training



Please sign in

Training Refresher Topics

- License and authorization
- Ordering radioactive material & inventory
- Waste
- Safe radioactive material use
- Monthly surveys
- ALARA
- Security
- Exposure response

Radiation Exposure

Small quantities of radioactive materials are used at GWU. Only very small radiation doses are expected for the users of radiation/radioactive material. No doses are expected for any other personnel. No biological effects are expected at these low dose levels.

License

- GWU is licensed to use radioactive material (RAM) by the Nuclear Regulatory Commission (NRC).
- Our license is a “Broad Scope License” and allows us to use a wide range of isotopes within activity limits, providing that we conduct our Radiation Safety program in accordance with our license application as submitted to the NRC as well as comply with Federal regulations. Some important elements of the program are:

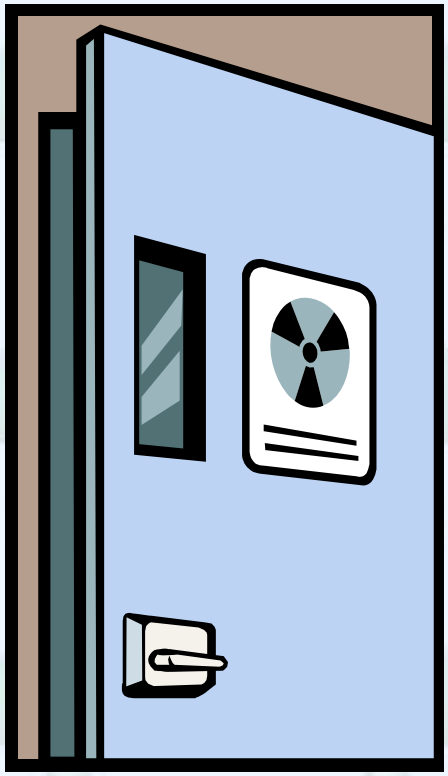
- Radiation Safety Officer (RSO)
- Radiation Safety Committee (RSC)
- Authorized User (AU)
- Training with examination
- Document RAM use and waste
- Security of RAM
- Conduct periodic surveys

Authorization

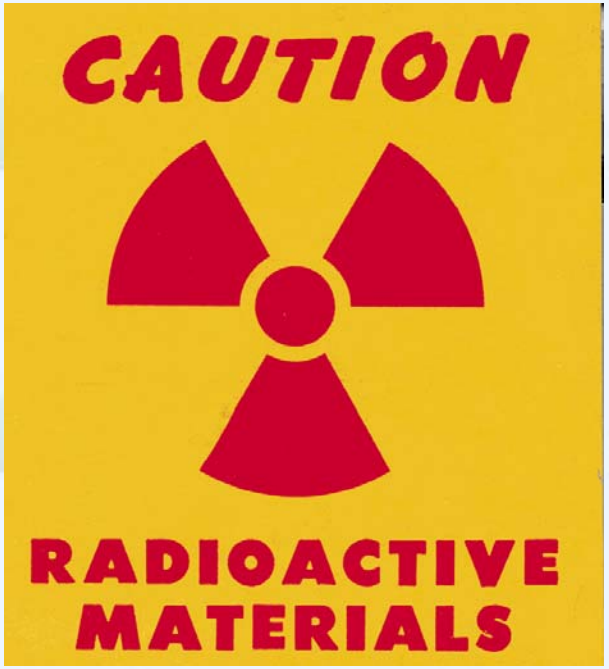
- Authorized Users - approved by the Radiation Safety Committee (RSC)
- Only AUs or those under them can use RAM
- AU - principal investigator with the responsibility for ensuring that his/her workers follow procedures.
- Each AU authorization is specific for each isotope, activity limits (on hand and annual), rooms for use.
- All users of RAM must be trained and pass an examination as well as demonstrate competence in handling RAM.
- Authorizations are renewed by the AU and approved by the RSO annually and include a physical inventory of RAM on hand.

Authorization cont.

- Only rooms on the authorization can have RAM storage or use. These rooms must have:
  - Placard in hall
  - Caution sign on lab door
- AU programs must have means to conduct contamination surveys.
- AUs must maintain the radiation binder which contains at minimum:
  - AU guide
  - Utilization logs
  - Protocols
  - Reg guide 8.29 and 8.13



Hall Placard



George Washington University • Laboratory Hazard Information Sheet

Room #: _____ Department: _____ BioSafety Level ____ Lab

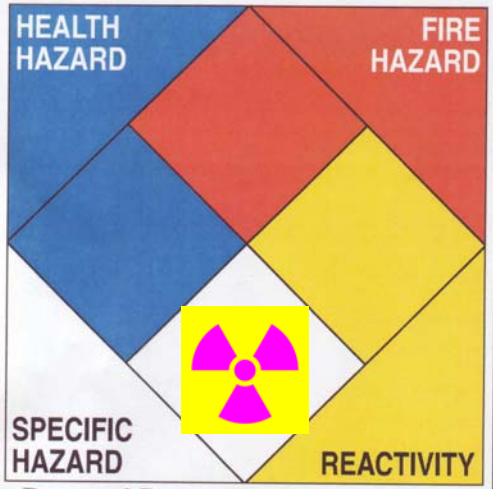
Principal Investigator: _____ Phone: (___) ____-_____

24-Hour Emergency Contact Information:

Home: (___) ___-_____ Cell: (___) ___-_____ Pager: (___) ___-_____

Routine Access Information:

[ ] Housekeeping and Support Services may enter to clean floors and empty trash only
[ ] Housekeeping and Support Services may enter the lab only when escorted
[ ] NO ROUTINE ACCESS



Special Hazards:

Personal Protective Equipment:

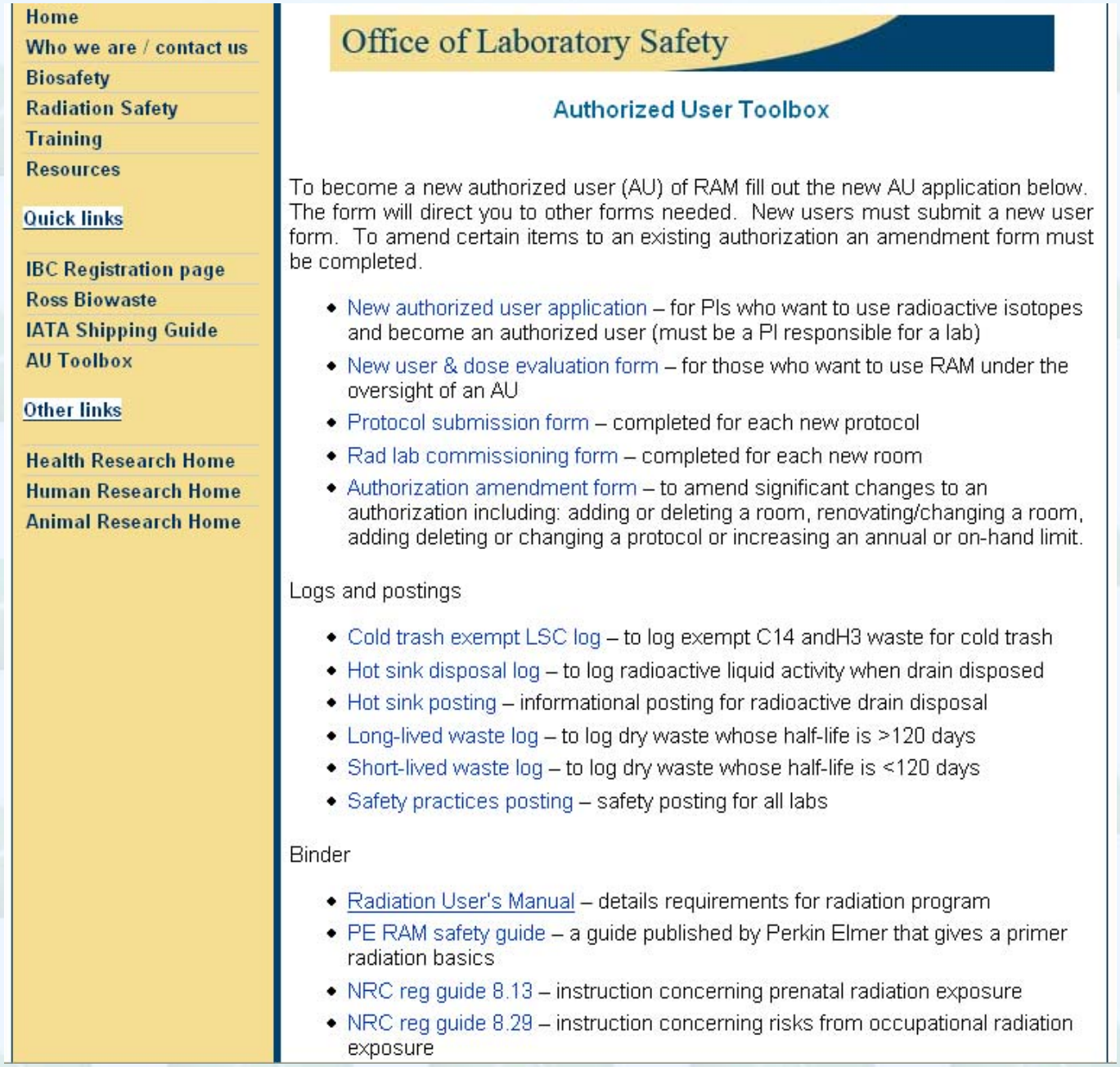
The Office of Research Safety, Bio-Security & Emergency Management is responsible for all University research laboratory facilities and is located in Ross Hall, Suite 617 - PHONE: 4.3282, FAX: 4.2522, EMAIL: safety@gwumc.edu, WEB: www.gwumc.edu/research/labsafety.htm. ORSBSEM is on-call 24x7 to respond to emergencies.

Employees are entitled to Material Safety Data Sheets (MSDS) or other information on suspect hazards.

Authorization cont.

- Renewals – annually you will be sent a renewal form to correct, sign and return to OLS.
- Substantial changes to an authorization such as room change, new isotope, on-hand limit, etc. will need an amendment form (on the website)
- New users
  - Study user manual & Perkin Elmer guide
  - Complete new user/dose eval form
  - Attend training & exam (Schedule as needed)
- Almost everything you need is at the OLS website
- If anything is amiss on the website, please contact Dan Hibbing (rsodjh@gwumc.edu)

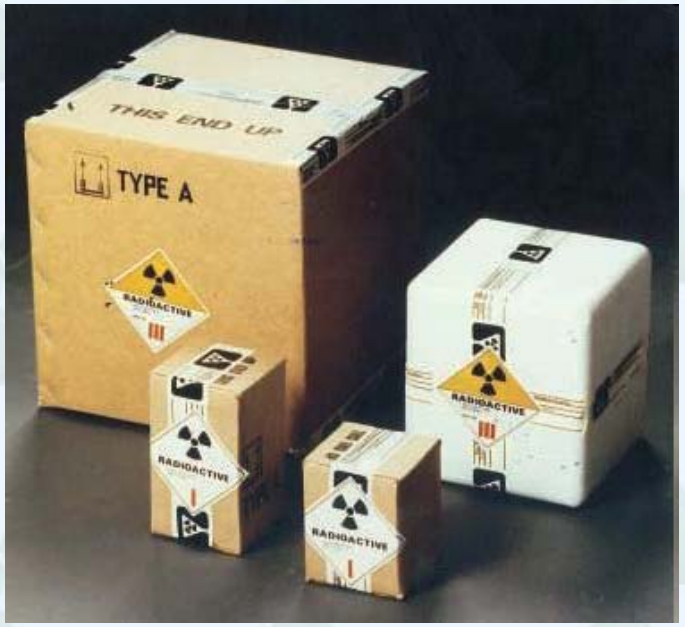
On the Web


Home
Who we are / contact us
Biosafety
Radiation Safety
Training
Resources
Quick links
IBC Registration page
Ross Biowaste
IATA Shipping Guide
AU Toolbox
Other links
Health Research Home
Human Research Home
Animal Research Home
Office of Laboratory Safety
Authorized User Toolbox
To become a new authorized user (AU) of RAM fill out the new AU application below. The form will direct you to other forms needed. New users must submit a new user form. To amend certain items to an existing authorization an amendment form must be completed.
New authorized user application – for PIs who want to use radioactive isotopes and become an authorized user (must be a PI responsible for a lab)
New user & dose evaluation form – for those who want to use RAM under the oversight of an AU
Protocol submission form – completed for each new protocol
Rad lab commissioning form – completed for each new room
Authorization amendment form – to amend significant changes to an authorization including: adding or deleting a room, renovating/changing a room, adding deleting or changing a protocol or increasing an annual or on-hand limit.
Logs and postings
Cold trash exempt LSC log – to log exempt C14 andH3 waste for cold trash
Hot sink disposal log – to log radioactive liquid activity when drain disposed
Hot sink posting – informational posting for radioactive drain disposal
Long-lived waste log – to log dry waste whose half-life is >120 days
Short-lived waste log – to log dry waste whose half-life is <120 days
Safety practices posting – safety posting for all labs
Binder
Radiation User's Manual – details requirements for radiation program
PE RAM safety guide – a guide published by Perkin Elmer that gives a primer radiation basics
NRC reg guide 8.13 – instruction concerning prenatal radiation exposure
NRC reg guide 8.29 – instruction concerning risks from occupational radiation exposure

www.gwumc.edu/research/home.htm >> AU toolbox

Ordering RAM

- Radiation Safety receives quotes from vendors for RAM for agreed prices.
- Your department places order through EAS Oracle or iBuy. OLS will approve the order if lab is authorized for product and with in limits (annual and on-hand)
- Contact OLS if your lab needs to place an order differently than the above steps



Ordering RAM (cont)

- Proper ordering details:
  - Addressed to: Dan Hibbing/[PI]

    Ross Hall Recv-Loading Dock
  - Account: 54521- Radioactive Lab Supplies
  - DOT Hazard Class (7)
  - Supplier Item Number is included along with a description
  - Proper shipping charges
  - Questions need to be directing to OLS prior to order

Inventory

- Isotopes - received by a user and secured (locked) immediately. You will receive a utilization log sheet with the order (fridge or binder)
- RAM used must be entered on the utilization log (fill in all blanks)
- Stock vials must be kept stored in their container (pig) and it must be labeled with the 4 digit inventory #.

- Inventory ***cannot*** be given to other labs without OLS approval. Please contact Dan Hibbing if RAM needs to be moved between labs.

ISOTOPE RECEIPT and UTILIZATION LOG

AU: Jones Pkg #: 2999
Supplier: Perkin Elmer Cat. #: BLU 507T
1.0 mCi of ^{32}P Received on: 1/11/07

gross mrem per hour — 1 meter: 0.006 Surface: 0.125 Detector: B9B0H Bkgd: 0.005

gross cpm per 300 cm² — Outside: 48 Inside: 52 Detector: RSO1SC Bkgd: 51

Chem/bio. Hazard? : No RSO Tech: GDS

Example

DATE	ACTIVITY REC'D, mCi	ACTIVITY USED, mCi	ACTIVITY LEFT, mCi	STORAGE PLACE	LABELED & LOCKED?	STAFF INITIALS
1/11/07	1.0	None	1.0	Frig 699	(Yes) / No	GDS
1/12/07	1.0	0.1	0.9	"	(Yes) / No	GDS
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	
					Yes / No	

Comments: _____

(This form must be retained for three years after the last date recorded on the form).

HN2.3 Rev. 05/15/96

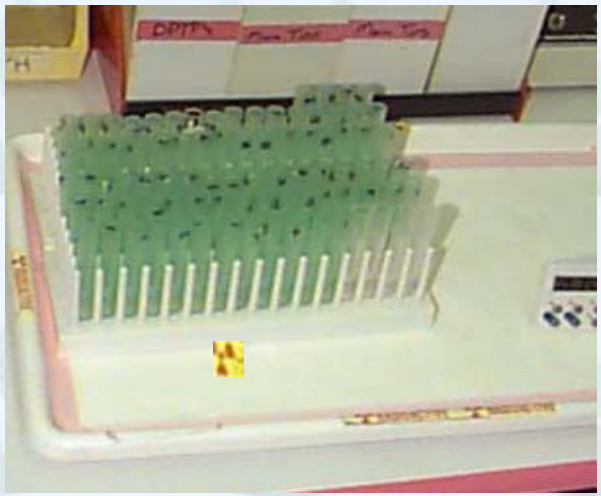
Waste

- Dry Solid Material (DSM)
  - Segregate by isotope in separate boxes (“hat box”), labeled correctly.
  - All waste added is entered on the DSM log on waste box.
  - Call for pickup when full (or 1 yr)
  - NO STOCK VIALS (even if empty).
  - NO LIQUIDS
  - NO HAZ MAT – ie: lead, mercury, chemicals
  - NO SHARPS OR BIOWASTE
  - NO FOOD

Waste cont.

- Liquid radioactive waste (non-hazardous waste)
  - Liquid waste - disposed of in a designated “Hot Sink” which must be marked with rad tape and have a sign posted.
  - Run large amounts of water before, during and after release.
  - Don’t splash. No contamination on bench around sink. Limit contamination in basin.
  - Estimate activity and record on the Hot Sink disposal log. Logs will be picked up periodically.
  - Must not exceed monthly disposal limits per isotope.
  - Must be sewer disposable: no hazardous waste (pH 5 - 9)
  - *No liquid disposed direct from stock vial.*

Secondary **containment for all radioactive liquids**



Waste cont.

- Stock vials
  - To dispose of a stock vial call Radiation Safety. We will collect the vial, sign utilization log and give you a copy.
  - Do not discard vials in dry waste or pour remaining liquid in hot sink
  - Vials do not need to be decayed prior to pickup, contact OLS as soon as a vial is no longer needed.
- Scintillation vials
  - ^{3}H / ^{14}C – If <50,000 cpm discard in “cold trash” waste. Update exempt vial disposal log.
  - All other hot vials must be placed upright in trays and labeled “Caution Radioactive Material”, isotope and estimate activity. Call for pickup or if large volumes expected.
  - Never discard vials with DSM waste.

DISPOSAL LOG
3H and 14C Only
Liquid Scintillation Vials Only

EXAMPLE EXAMPLE

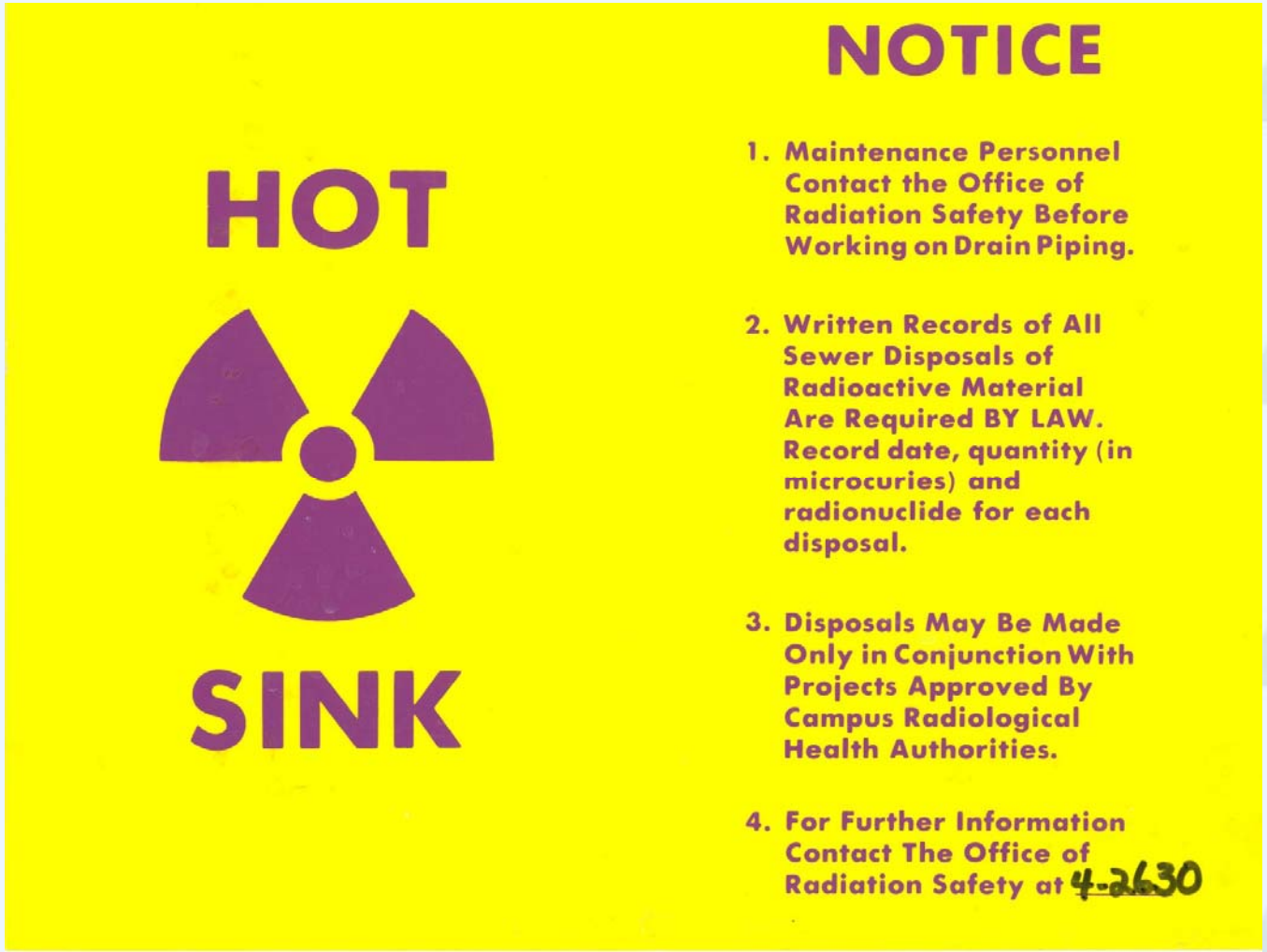
AFTER REMOVAL OF ALL RADIOACTIVE LABELING, *VIALS CONTAINING BIODEGRADABLE LIQUID SCINTILLANTS WITH* ***111,000 dpm per g of media or less of H-3 and C-14 ONLY*** *MAY BE PUT IN "**COLD TRASH**" NORMAL TRASH (OR IN MEDICAL WASTE WHEN NEEDED), IN A BAG WITH ABSORBENT. LOG THE DATA OF EACH DISPOSAL BELOW. RADIATION SAFETY WILL RETAIN THIS LOG.*

ROOM #: 699 **AUTHORIZED USER:** JONES

Date	Circle Isotope	Total Activity (dpm)	Number of Vials	Size of Vials	Person Making Disposal Please print name.
1/11/07	(H-3) / C-14	200,000	35	7 mL	GREG JONES
1/15/07	(H-3) / C-14	300,00	40	7 mL	GREG JONES
	H-3 / C-14				
	H-3 / C-14				
	H-3 / C-14				
	H-3 / C-14				
	H-3 / C-14				
	H-3 / C-14				
	H-3 / C-14				
	H-3 / C-14				
	H-3 / C-14				
	H-3 / C-14				
	H-3 / C-14				

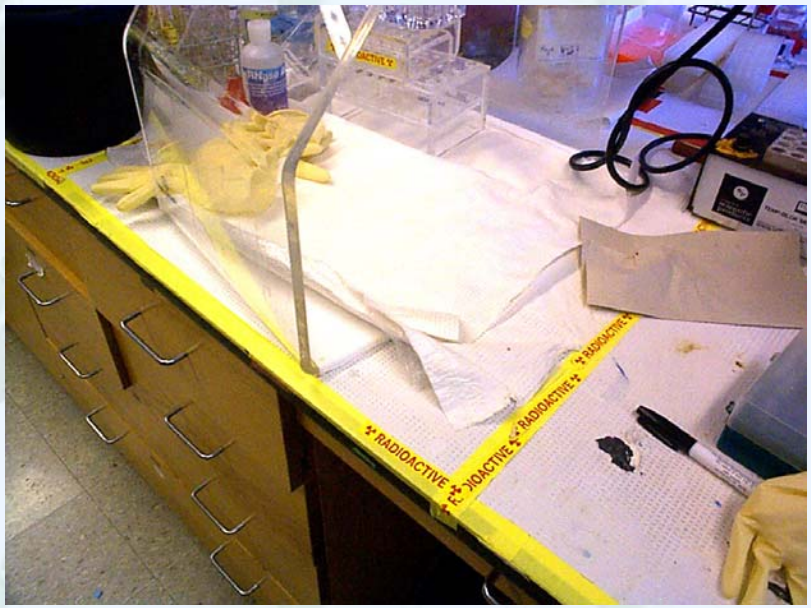
Date Sheet Collected: _____ Approved by: _____ Date: _____

Hot Sink Sign


HOT
SINK
NOTICE
1. Maintenance Personnel Contact the Office of Radiation Safety Before Working on Drain Piping.
2. Written Records of All Sewer Disposals of Radioactive Material Are Required BY LAW. Record date, quantity (in microcuries) and radionuclide for each disposal.
3. Disposals May Be Made Only in Conjunction With Projects Approved By Campus Radiological Health Authorities.
4. For Further Information Contact The Office of Radiation Safety at 4-2630

RAM Use – work areas

- RAM is only to be used in designated use areas - mark with radiation tape and use plastic backed absorbent paper. OLS will help delineate radiation areas from cold areas.
- Any equipment where RAM is used or stored must be labeled ie: hoods, refrigerators, centrifuges, etc.

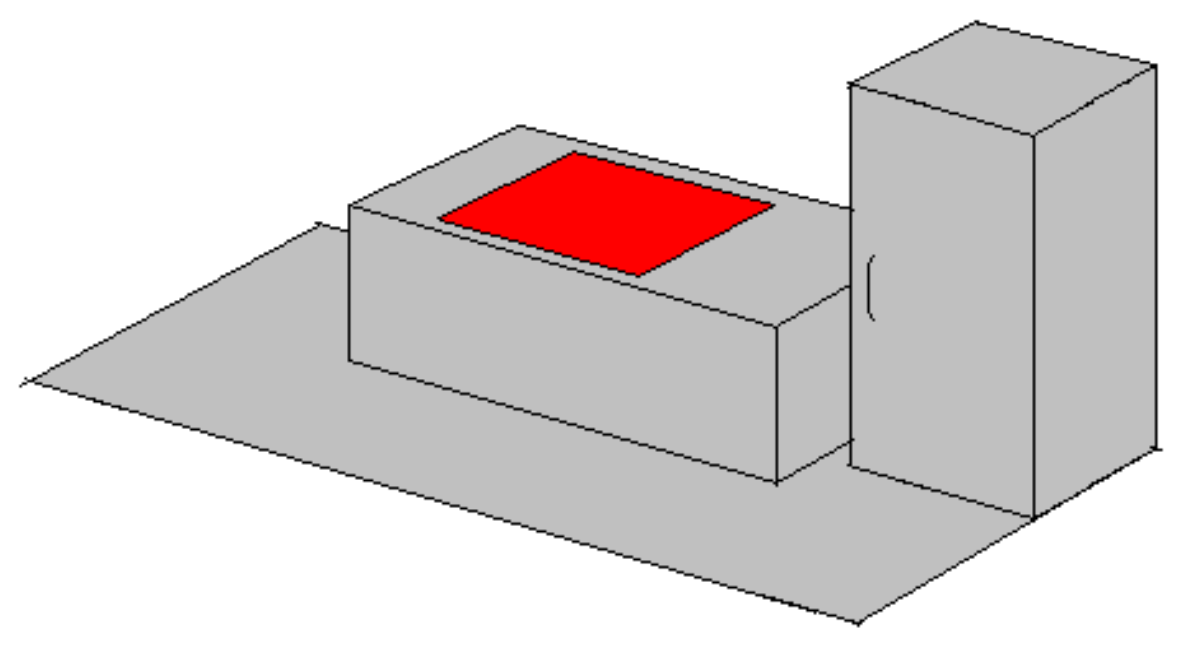


RAM Use - surveying

- As you work, survey your gloves to detect any contamination
- The meter must always be on when working with RAM (if detectable)
- When work is finished, benches, clothing, floors and other equipment should be surveyed to detect any contamination (Move the detector slowly)
- Contamination:
  - > 2X background (meter)
  - > 150 cpm (wipe test)

RAM Use - contamination

- No contamination should be present ***outside*** of rad use areas.
- If contamination is discovered, it should be cleaned up immediately. If you suspect contamination with ^{3}H do wipe tests to survey.(^{35}S or ^{14}C may need wipe tests if low activity).



RAM Use - contamination

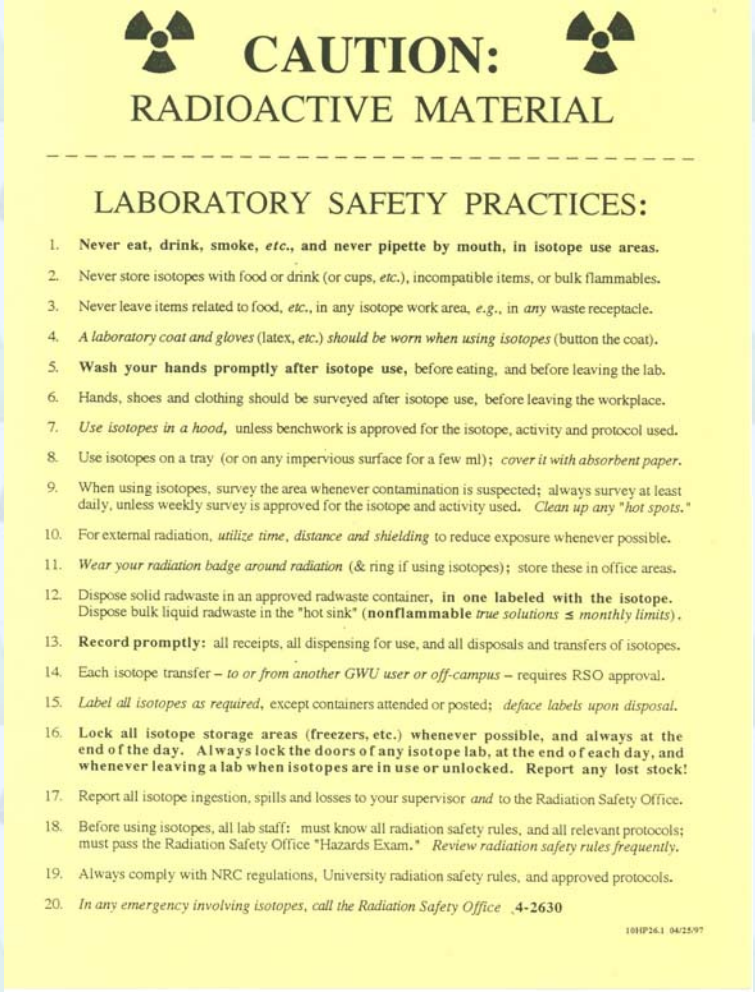
- Contamination ***inside*** radiation areas should be avoided. if discovered, clean as soon as work is complete (contaminated bench paper goes in DSM)
- Small amounts of contamination may persist in work areas due to residual in equipment and may be unavoidable, but, must be below following levels when measured at the edge of the bench:
  - For ^{125}I and ^{51}Cr, using a 44-3 meter < 15000 cpm
  - For all other isotopes, using a GM meter < 1500 cpm
- Dose rate limit at radiation area boundary is 0.5 mRem/hr. The above count rates are designed to keep doses well under this level.

RAM Use – clean up

- Contamination should be cleaned with bubbling spray such as Count-Off or Dow cleaner and paper towels.
- Clean small areas at a time to avoid spreading any contamination
- The area should be surveyed until no removable contamination is detected and discarded in DSM.
- For more than incidental contamination, contact Radiation Safety for assistance and inform your AU. Mistakes will happen, but please get help.

Safe Lab Practices

- No eating, drinking, chewing gum etc in rad labs.
- Never store food in rad storage areas, e.g. fridges.
- Wash your hands promptly after handling any radioactive material.
- Wear prescribed dosimeters. Dosimetry will not be prescribed when using tritium or extremely low doses expected.



CAUTION:
RADIOACTIVE MATERIAL

LABORATORY SAFETY PRACTICES:

1. **Never eat, drink, smoke, *etc.*, and never pipette by mouth, in isotope use areas.**
2. Never store isotopes with food or drink (or cups, *etc.*), incompatible items, or bulk flammables.
3. Never leave items related to food, *etc.*, in any isotope work area, *e.g.*, in *any* waste receptacle.
4. *A laboratory coat and gloves* (latex, *etc.*) *should be worn when using isotopes* (button the coat).
5. **Wash your hands promptly after isotope use,** before eating, and before leaving the lab.
6. Hands, shoes and clothing should be surveyed after isotope use, before leaving the workplace.
7. *Use isotopes in a hood,* unless benchwork is approved for the isotope, activity and protocol used.
8. Use isotopes on a tray (or on any impervious surface for a few ml); *cover it with absorbent paper.*
9. When using isotopes, survey the area whenever contamination is suspected; always survey at least daily, unless weekly survey is approved for the isotope and activity used. *Clean up any "hot spots."*
10. For external radiation, *utilize time, distance and shielding* to reduce exposure whenever possible.
11. *Wear your radiation badge around radiation* (& ring if using isotopes); store these in office areas.
12. Dispose solid radwaste in an approved radwaste container, **in one labeled with the isotope.** Dispose bulk liquid radwaste in the "hot sink" (**nonflammable** *true solutions ≤ monthly limits*).
13. **Record promptly:** all receipts, all dispensing for use, and all disposals and transfers of isotopes.
14. Each isotope transfer – *to or from another GWU user or off-campus* – requires RSO approval.
15. *Label all isotopes as required,* except containers attended or posted; *deface labels upon disposal.*
16. **Lock all isotope storage areas (freezers, etc.) whenever possible, and always at the end of the day. Always lock the doors of any isotope lab, at the end of each day, and whenever leaving a lab when isotopes are in use or unlocked. Report any lost stock!**
17. Report all isotope ingestion, spills and losses to your supervisor *and* to the Radiation Safety Office.
18. Before using isotopes, all lab staff: must know all radiation safety rules, and all relevant protocols; must pass the Radiation Safety Office "Hazards Exam." *Review radiation safety rules frequently.*
19. Always comply with NRC regulations, University radiation safety rules, and approved protocols.
20. *In any emergency involving isotopes, call the Radiation Safety Office* **4-2630**

10HP26.1 04/25/97

Personal Protective Equipment

- Lab coat, disposable gloves and eye protection are required at all times.
- Refer to authorization for specific requirements.
- Do not wear baggy clothing, dangling jewelry, and cinch up loose long hair.
- Legs must be covered and close toed shoes worn.

Survey Meters

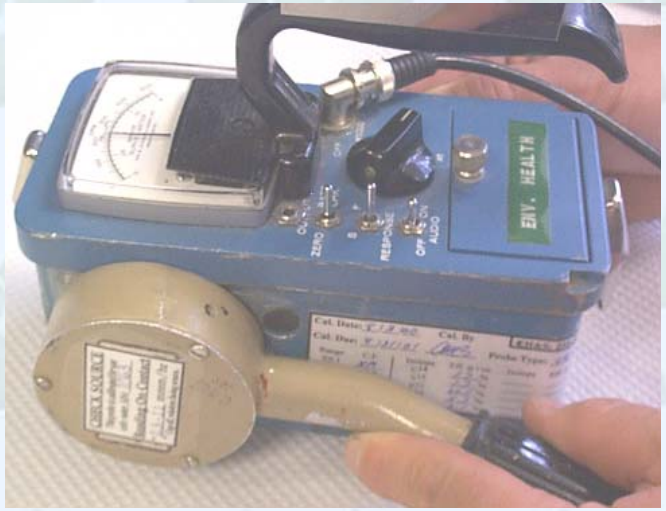
Survey Meter w/ "pancake" GM detector

Survey Meter w/ "end window" Geiger Muller GM detector

Survey Meter w/ low energy gamma detector Ludlum 44-3 (^{125}I, ^{51}Cr, γ emitters)

Survey Meters

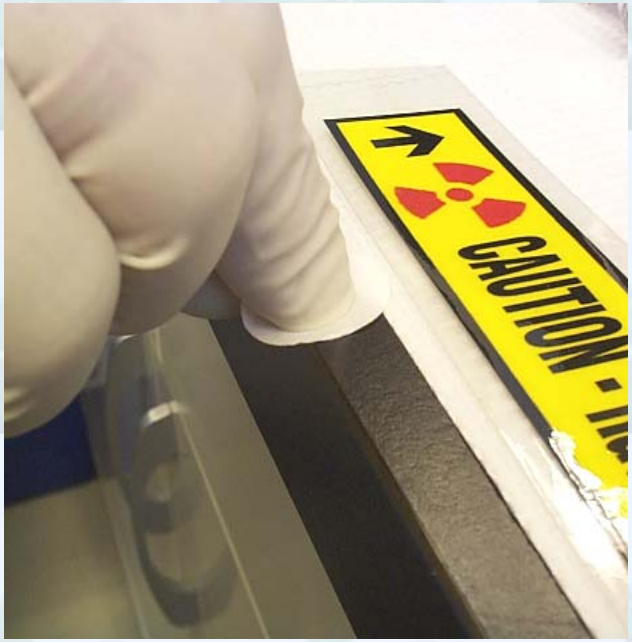
- Will not detect ^{3}H (must use liquid scintillation to detect)
- Are calibrated annually
- Always check batteries to make sure they are in range as well as a physical check for damage.
- Check the meter before each use by holding the probe against the check source. It should closely match calibration number on sticker.



- A properly working GM meter has a background count rate of about 40-60 cpm. If it is not working contact OLS.

Wipe Surveys

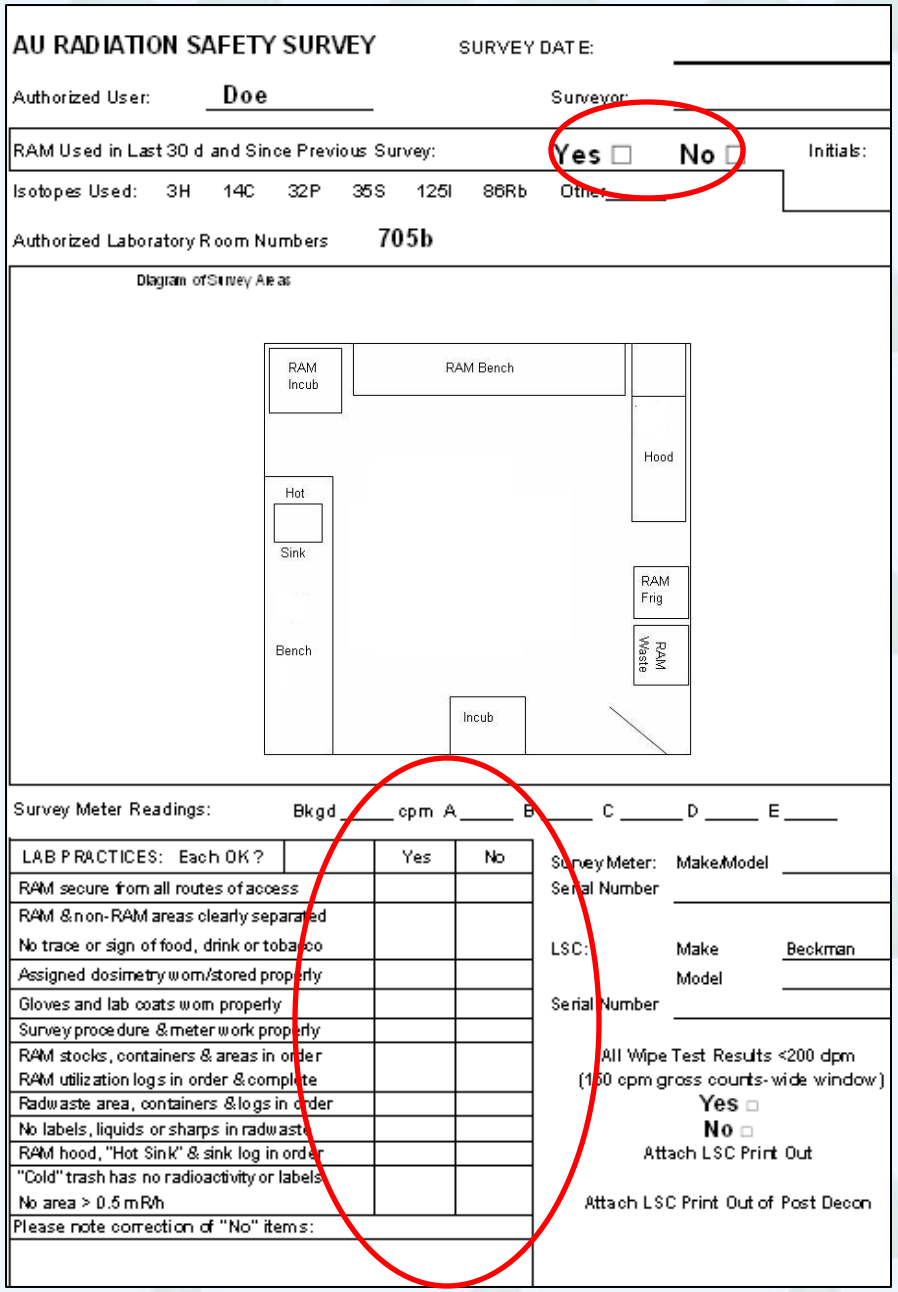
- Used to determine if contamination is removable or fixed
- Use 2.5 cm filter disc for LSC counting
- Cover at least 100 cm^2 of surface
- Limits are based on 100 cm^2
- Only way to detect ^3H
- For instructions on LSC counting, contact OLS or discuss with your PI



Monthly surveys

- A documented survey must be done each month when RAM was used with a meter and LSC swipes
- Labs not using that month still must fill out a survey form

- Therefore, there must be a sheet in the binder for every month of the year



AU RADIATION SAFETY SURVEY SURVEY DATE:

Authorized User: Doe Surveyor:

RAM Used in Last 30 d and Since Previous Survey: Yes ☐ No ☐ Initials:

Isotopes Used: 3H 14C 32P 35S 125I 86Rb Other

Authorized Laboratory Room Numbers 705b

Diagram of Survey Areas

RAM Incub
RAM Bench
Hood
Hot
Sink
Bench
RAM Frig
RAM Waste
Incub

Survey Meter Readings: Bkgd ____ cpm A ____ B ____ C ____ D ____ E ____

LAB PRACTICES: Each OK?	Yes	No
RAM secure from all routes of access		
RAM & non-RAM areas clearly separated No trace or sign of food, drink or tobacco		
Assigned dosimetry worn/stored properly		
Gloves and lab coats worn properly		
Survey procedure & meter work properly		
RAM stocks, containers & areas in order RAM utilization logs in order & complete		
Radwaste area, containers & logs in order		
No labels, liquids or sharps in radwaste		
RAM hood, "Hot Sink" & sink log in order		
"Cold" trash has no radioactivity or labels No area > 0.5 mR/h		
Please note correction of "No" items:		

Survey Meter: Make/Model
Serial Number

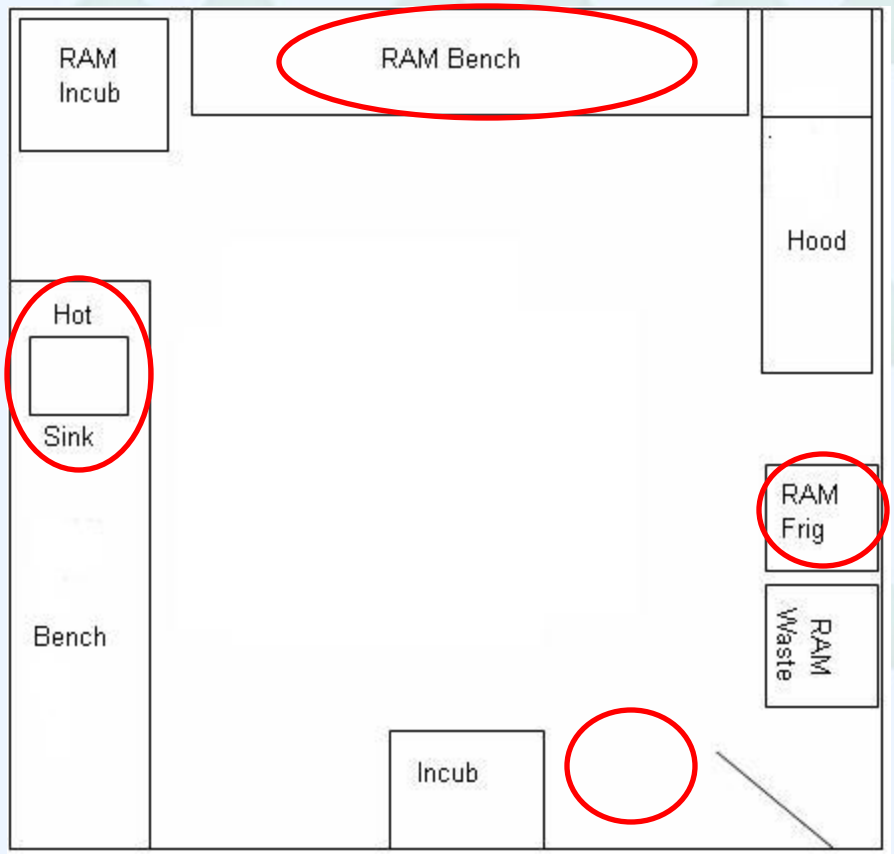
LSC: Make Beckman
Model
Serial Number

All Wipe Test Results <200 dpm
(100 cpm gross counts-wide window)
Yes ☐
No ☐
Attach LSC Print Out

Attach LSC Print Out of Post Decon

Monthly surveys

- Take swipes of areas that are likely to have contamination such: hot sink, rad bench, rad area floors, door handles, floors near exit, equipment such as fridges and centrifuges.
- Be sure to differ swipe locations from month to month



ALARA

As low as reasonably achievable (ALARA) – To minimize dose from external sources there are 3 primary methods:

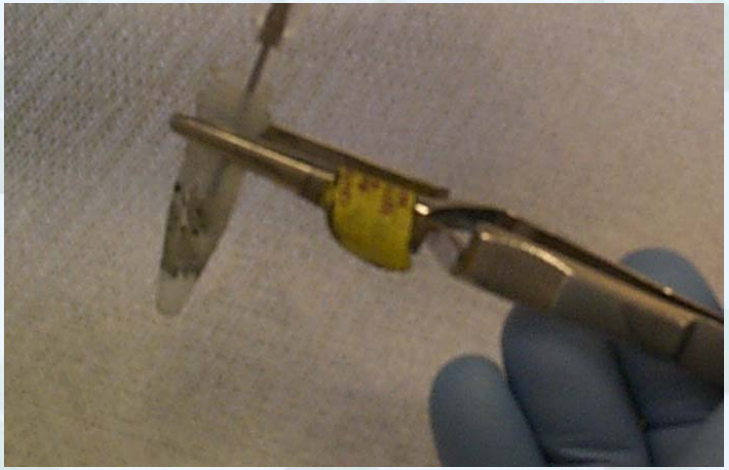
- Time
- Distance
- Shielding

As Low As Reasonably Achievable (ALARA)

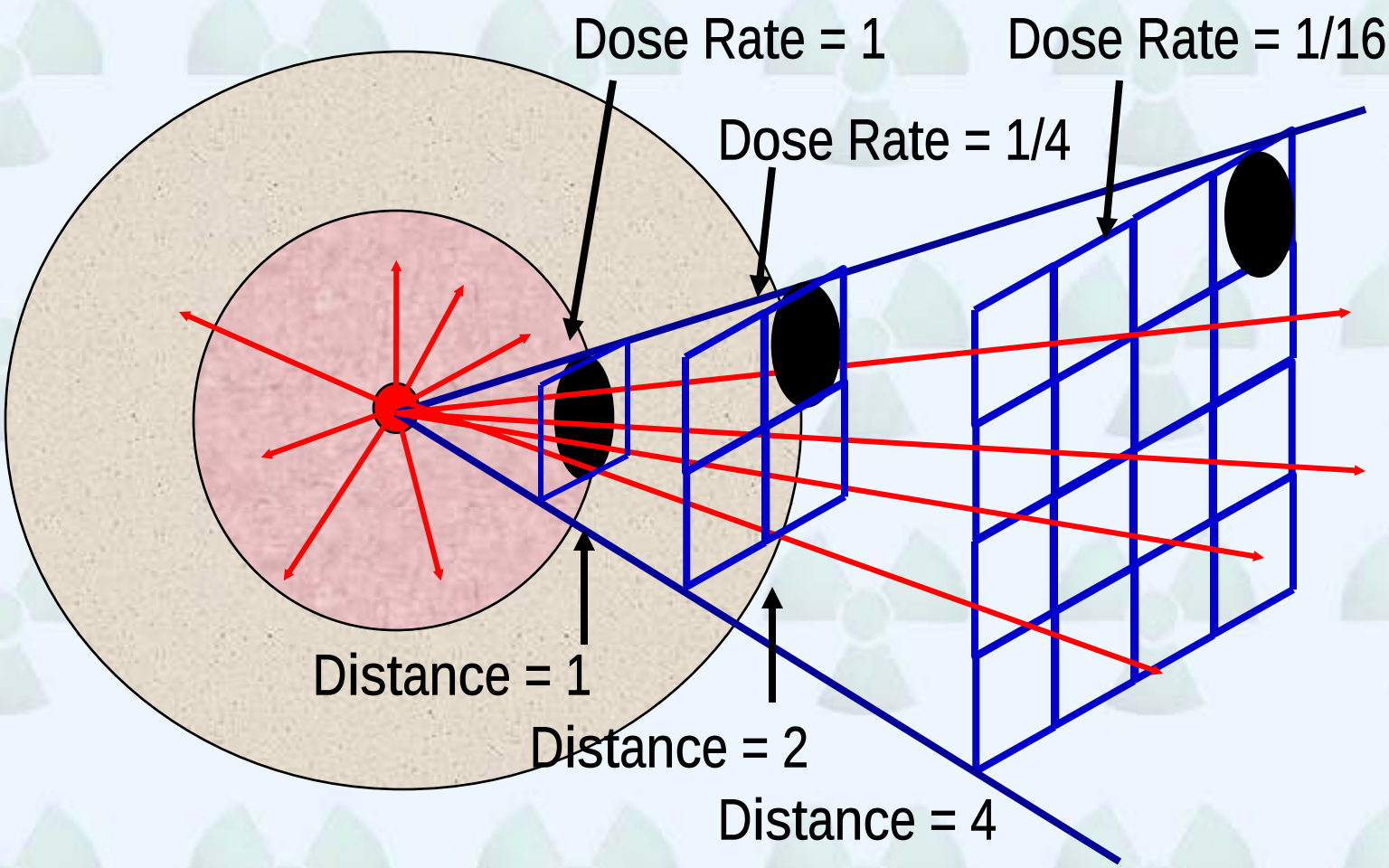
- TIME - minimize the time spent receiving a dose
  - Plan you experiment and have all materials present before introducing RAM
  - Work methodically and at a good pace but don't rush as this could cause accidents
  - Put stocks away soon after you are finished with them

As Low As Reasonably Achievable (ALARA)

- DISTANCE – keep as much distance between you and the source as possible
  - Doubling the distance from the source reduces the dose to one quarter
  - Set stock vials away from you when not handling them
  - Use tongs or tweezers to hold containers when feasible
  - Store waste in a low traffic area



Inverse Square Law



As Low As Reasonably Achievable (ALARA)

- SHIELDING – block radiation with a suitable material
  - Use an appropriate material at an adequate thickness to stop radiation.
  - Protects your body when working and protects those nearby from stocks or waste.
    - High energy beta emitters (^{32}P) –plexiglass (1cm)
    - Gamma emitters (^{125}I) – lead (sheets, foil or bricks)
  - Put vials back in protective packaging, such as plastic vials or lead foil, when finished.

Security

- Radioactive material is only to be used by those who are authorized by OLS.
- RAM must never be left unattended, rooms must be locked and RAM must be locked in a fridge or cabinet.
- Access must be limited to those who have a need to be there and all must wear identification
- If someone is not wearing a badge ask if you can help them and direct them and escort them to the front desk for assistance.
- Report any suspicious activity to security

Procedure if Individuals are Contaminated

If you find personnel contamination,

take the following steps:

1. Have someone call OLS, 4-2630
2. Remove clothing that is contaminated (take measures for modesty if someone must disrobe)
3. Start washing area.
4. Complete a GWU incident form and submit it to MC safety. Medical treatment is available if necessary

Decontamination

To decontaminate skin:

1. If a large area, wash with mild soap and water right in the sink.
2. If only a small area, use a wet towel and mild soap to start decontaminating.
3. Check towel with meter.
4. Avoid spreading the contamination to other areas.

Decontamination

Don’t scrub contaminated area!

Your skin turning red is a way of letting you know to stop

DO NOT USE ANYTHING EXCEPT MILD SOAP!

Emergency Contacts

Office of Laboratory Safety

4-2630

Radiation Safety Officer

682-551-2424

Also check “NRC Notice to Employees” posted in the radiation use and storage areas

More Information

- Refer to the NRC REGULATORY GUIDE 8.29 on "Instruction Concerning Risks from Occupational Radiation Exposure," and NRC REGULATORY GUIDE 8.13 on "Instruction Concerning Prenatal Radiation Exposure". These documents are available from the Office of Laboratory Safety (call 202-994-2630).
- The OLS will provide confidential advice to those who are pregnant. A pregnant person need not declare their pregnancy in order to receive this advice.

Questions?